

1 Introduction

This contribution is to kick off the following discussion.

CB: # 17_QoSmonURLLC

- (HW,E//) **Distribution of UL packet delays indicated by SA5 can be calculated either based on average values defined in TS 28.552, or on per packet delay measurement samples by RAN implementation; per packet RAN part delay measurement is not currently supported in RAN (related definition is out of RAN3 scope)**

- (Intel) **NGAP, E1AP, F1AP, UP need enhancement to support this functionality**

- (ZTE) **NG-U needs enhancement to support this functionality**

(HW - moderator)

[NWM] Summary of offline disc R3-212614

In the LS from SA5 in R3-211467, they provide the following action to RAN3:

To RAN3 group.

ACTION: SA5 respectfully asks RAN3 to take the above-mentioned information into consideration and provide an UL packet delay result reported by NG-RAN excluding the UL D1 packet delay for QoS monitoring.

The reason is that SA5 thinks that using existing averaged per DRB RAN part delays specified in TS 28.552 cannot get the distribution of packet delays which are also defined in TS 28.552

- Distribution of UL packet delays between NG-RAN and UE, in clause 5.1.1.1.7 of TS 28.552.
- Distribution of UL packet delays between PSA-UPF and UE, in clause 5.4.9.2.2 of TS 28.552.

According to all the companies' papers under this topic, the offline discussion is organized as following:

Step 1: Clarify and acknowledge the issues in the SA5 LS, i.e., clarify on the calculation of Distribution of UL packet delays between NG-RAN and UE and the Distribution of UL packet delays between PSA-UPF and UE.

Step 2: Clarify on the need of reporting UL delay results to UPF for SA5's performance measurement

Step 3: Proceed the CRs to RAN3 specifications if step 1 and 2 are done

Step 4: Proceed the reply LS to SA5 with/without RAN3 CRs based on the result of the offline discussion

Step 3 and 4 are expected to be triggered at the 2nd round discussion.

2 For the Chairman's Notes

Summary:

Q1: The two measurements in the LS required by SA5 are already supported by RAN or not?

Conclusion: no consensus. Checking with RAN2 is needed.

Q2: Clarification on reporting UL delay results to UPF for SA5 PM purpose.

Conclusion: no consensus.

R3-212001 is revised in R3-212905, LS to SA5, agreed.

3 Second Round Discussion

Summary to the first round discussion:

Question 1: Issue in SA5 LS is acknowledged?

Summary: 2 companies think that RAN3 impact is needed. 2 companies think that for the time being, there is nothing that RAN3 needs to do. 2 companies think that distribution of UL packet delays should be defined in TS 38.314 which should be the scope of RAN2.

Conclusion: no consensus on the issue in SA5 LS.

Question 2: Gap analysis between SA5 requirements in the LS and RAN spec

Summary : 1 company thinks that DU should report the unaveraged sum of D2.1 and D2.2 to CUUP. 1 company thinks that no any gap between RAN3 spec and SA5 requirement. 2 companies think that RAN2 needs to look at the definition firstly. 1 company insists to report the UL delay without D1 to UPF.

Conclusion: no consensus. let RAN2 to study the definition is proposed.

Question 3: Clarify on the need of reporting UL delay results to UPF for SA5's performance measurement

Summary: 3 companies don't see the need to report UL delay results to UPF for PM purpose. 1 company pointed out that 1 correction should be treated. 2 companies think it is needed.

Conclusion: no consensus on the need of reporting UL delay results to UPF for PM purpose. Proceed the correction proposal in 2nd round.

Taking above summary into account, the moderator would like to proceed in the following. Please provide your comments below.

Let's check companies views on sending reply LS to SA5 to ask them consult RAN2 about the feasibility of distribution of UL packet delays.

Feedback Form 1: Do you agree to send reply LS to SA5?

1 – Nokia France yes
2 – Ericsson-LG Co. We could be ok to send a reply LS to SA5 stating the following: RAN3 does not see the need to report the distributed delay measurements mentioned by SA5 from RAN to the UPF. The delay distribution measurements mentioned by SA5 are already defined in 28.552 and can be collected as PMs from the RAN. If SA5 is requesting packet delay distribution measurements on a per UE basis, then SA5 should contact RAN2 (responsible for UE measurement definitions in TS38.314) and explain why such measurements are needed. RAN3 concluded that the aspects highlighted by SA5 in their LS do not have an impact on RAN3 specifications.
3 – Intel Technology India Pvt Ltd If we are going to reply LS, we think we should not say that what is requested by SA5 does not have impacts on RAN3 specifications, as there is no consensus. And though per-UE measurement is already possible (to calculate average), replying to recommend SA5 consult with RAN2 about per-UE measurement "requirement" seems acceptable way forward. In this sense, we are fine with Nokia's scope of the reply LS below.
4 – ZTE Corporation Share the view as Intel

If above question is yes. please list the scope of the reply LS below.

Feedback Form 2: Scope of the reply LS

1 – Nokia France The proposed scope is OK: The delays reported on NG-U are average delays and according to SA5's LS are not suitable for calculation of distribution of packet delays. RAN2 is in charge of the measurements definition, and if SA5 needs new RAN measurements to be supported such request would have to be sent to RAN2.
2 – Intel Technology India Pvt Ltd If we are going to reply LS, the Nokia's proposal is fine with us.
3 – ZTE Corporation Fine with Nokia 's proposal

there is a proposal to add the missing stop indicator in E1AP:

Proposal 5: Include the missing "stop" indicator into QoS Monitoring Request IE in E1AP.

Feedback Form 3: Do you agree with the proposal?

1 – Nokia France

We believe that this proposal (in R3-212287) might rely on a misunderstanding. The stop indicator is already supported in E1AP, but in a different IE due to an ASN.1 issue (the QoS Monitoring Request IE is not extensible in ASN.1).

QoS Monitoring Disabled O ENUMERATED (true, ...) Indicates to stop the QoS monitoring.

2 – Intel Technology India Pvt Ltd

Thanks, Nokia is right.

3 – ZTE Corporation

Agree with Nokia, it has already defined.

4 Discussion

Step 1: Clarify and acknowledge the issues in the SA5 LS, i.e., clarify on the calculation of Distribution of UL packet delays between NG-RAN and UE and the Distribution of UL packet delays between PSA-UPF and UE.

Question: Issue in SA5 LS is acknowledged?

There are two understandings as per the papers.

- Option 1: As claimed in R3-212118, and R3-212000, the measurements referenced can already be collected by the OAM as performance measurements, hence no changes are needed to the RAN3 specifications.

- Option 2: As proposed in R3-212287, RAN3 specifications should be updated to support the UL delay distributions calculation.

Please provide your view on which option is your understanding and the reason.

Feedback Form 4: Clarification on the issue in SA5's LS

1 – Ericsson-LG Co.

As discussed in R3-212118, the measurements mentioned in the LS from SA5 are already defined in TS28.552 and for that they can be collected by the OAM. The scenario where the packet delay distribution measurements are requested to be included over the NG-U, so that the RAN can report them to the UPF, seems to be out of SA5 scope as there would be no OAM involvement in such measurements reporting. Besides, the use case that would trigger a need for such measurements is not clear and if at all, such use case should be discussed in SA2 and RAN3, rather than SA5.

The only plausible interpretation that could be given to the LS from SA5 is that SA5 is requesting packet delay distribution measurements on a per UE basis. In such case, SA5 should contact RAN2 (responsible for UE measurement definitions in TS38.314) and explain why such measurements are needed. In conclusion, the requests from the SA5 LS are not acknowledged and, as said in R3-212118, there is no action on RAN3.

2 – Intel Technology India Pvt Ltd

As discussed in R3-212287, currently D2.1 and D2.2 are calculated by gNB-DU in "average" and their sum is reported to gNB-CU via NR-U. In case of CU-DU split, gNB-CU cannot generate (SA5 requested) UL packet delay distribution measurement (between NG-RAN and UE) to OAM, which should consider non-averaged UL E2E values without D1, i.e. sum of non-averaged D2.1 and D2.2 values together with non-averaged D2.3 and D2.4 values, when putting into bins for UL packet delay distribution measurement between NG-RAN and UE. This is why SA5 sent this LS.

And given that anyway "average" value is calculated by averaging individual samples (as specified in TS 38.314), generating UL packet delay distribution measurement (between NG-RAN and UE) based on individual samples is already possible. There is no need to get consultation from RAN2. Moreover, RAN does not have to track each QoS flow packet configured for QoS monitoring feature within RAN. Currently, the subjected D2.1 to D2.4 are all calculated per DRB – there is no tracking of a certain QoS flow packet within the DRB to calculate D2.1 to D2.4. All we need for gNB-CU is to consider non-averaged sample values of D2.1 to D2.4 to generate UL packet delay distribution measurement (between NG-RAN and UE) and to report it to OAM. But at least, the sum of non-averaged D2.1 and D2.2 values is currently not provided from gNB-DU, and this should be supported by enhancing NR-U.

Furthermore, this LS is nothing to do with SA2. This is about SA5 requirement, not SA2. And also, we need to remember that QoS monitoring feature was initially started from SA5. The whole feature is from OAM requirement that relies on signaling within 5GC (over NG, E1, F1, etc.). From our understanding, there is no problem to support this SA5 requirement on top of what we have now on RAN3 interfaces.

3 – HuaWei Technologies Co.

We have similar understanding as E///. Usually, we defined PM counters in SA5 specifications, and RAN will report the counters as defined in SA5 spec to OAM directly via the southbound interface.

From this pov, all the counters defined in SA5 spec can be regarded as supported. Because RAN never report samples outside, but only the calculated values of the PM measurements as per SA5 definition.

Technically speaking, there is useless to report the samples of per DRB level UL pack delay UL D2,D3 If they cannot correlate with the ones in the CU. Sum of samples for packet 1 in DU and samples for packet 2 in CU is meaningless in mathematic.

4 – Nokia France

We understood SA5's request to be to report RAN packet delay measurements (UL/DL) via NG-U to the UPF for the purpose of delay distribution calculation in the OAM, however maybe SA5 didn't take into account that the measurements currently defined by RAN2 are average values so not suitable for distribution calculation. We're not sure such distribution calculation should be done in the RAN, but if so it would have to be defined in TS 38.314. Also, we see the point raised by HW that an advantage of using average delay values is the possibility to provide the total delay based on the sum of average values. We believe this request should be handled by RAN2 because any solution would impact TS 38.314 (send LS to RAN2).

5 – ZTE Corporation

The QoS monitoring feature was initially started from SA5. In the previous LS sent by SA5 (S5-196840/R3-196431), SA5 first requested RAN3 to support UL/DL packet delay measurement as "To RAN3 group. ACTION: SA5 respectfully asks if RAN3 would like to support the mechanism defined by SA2 for QoS Monitoring per QoS Flow per UE to assist URLLC service (see 5.33.3.2 of 23.501 [3]) in Rel-16."

We think that QoS monitoring requirements are also related to SA5, and if SA5 needs to obtain relevant delay measurements e.g., ul delay without d1, RAN3 needs to support. As 5.33.3.2 of 23.501 mentioned, the relevant measurements are reported over NG-U.

In addition, there are only average delay reports on the RAN side, so it is not necessary to introduce a new mechanism to distinguish whether the measurements that might be reported are per packet or average delay. Even the distribution of packet delay defined in TS28.552 is per packet, if the measurement period of ran part is not too long, then the distribution of data packet delay can still be observed through the average delay.

If the views to question 1 are not converged, then, further Clarify your interpretation to the two UL delay distribution measurements seems needed.

Question 2: what is already support and what is not supported by RAN for the UL delay distribution measurements in SA5?

Please provide your view on this.

Feedback Form 5: Gap analysis between SA5 requirements in the LS and RAN spec

1 – Ericsson-LG Co.

As mentioned above, the RAN3 specifications are correct and do not need to be modified. If the LS from SA5 refers to requesting packet delay distribution measurements on a per UE basis, then SA5 should contact RAN2 (responsible for UE measurement definitions in TS38.314) and explain why such measurements are needed

2 – Intel Technology India Pvt Ltd

As explained above, in case of CU-DU split, gNB-CU cannot properly generate (SA5 requested) UL packet delay distribution measurement between NG-RAN and UE and thus cannot report it to OAM. Currently, what is provided by gNB-DU is the sum of D2.1 and D2.2 (averaged) over NR-U. But gNB-CU needs the sum of non-averaged D2.1 and D2.2 values, in order to generate UL packet delay distribution measurement between NG-RAN and UE.

3 – HuaWei Technologies Co.

Basically, as I said above, two irrelevant samples sum does not make any sense. We are ok to let RAN2 to double check.

4 – Nokia France

Either option is fine with us: Let SA5 send LS to RAN2 explaining the need for distribution measurement, or RAN3 forwards the request from SA5.

5 – ZTE Corporation

As 5.33.3.2 of 23.501 mentioned by SA5, the relevant measurements are reported over NG-U. ran3 only need add the UL delay results excluding D1 in UL PDU SESSION INFORMATION Frame. As we discussed in Question1, Even the distribution of packet delay defined in TS28.552 is per packet, if the mea-

surement period of ran part is not too long, then the distribution of data packet delay can still be observed through the average delay.

Step 2: Clarify on the need of reporting UL delay results to UPF for SA5's performance measurement

In R3-212287, it is proposed to report the UL delay components to UPF for SA5's performance measurement purpose.

However, this requirement is not required by the LS. And on the other hand, reporting measurements to core network for PM purpose seems contradiction to the traditional way, by which, all PM related measurements are reported to the OAM directly via southbound interface.

Therefore, it is necessary to further clarify the need of reporting UL delay results to UPF for SA5's performance measurement purpose.

Please provide your view on this.

Feedback Form 6: Views collection on the need of reporting UL delay results to UPF for SA5 PM purpose

1 – Ericsson-LG Co.

We do not see the need for reporting packet delay distribution measurements to the UPF. The use case is unclear. It is also unclear how such reporting has any relevance to OAM procedures.

2 – Intel Technology India Pvt Ltd

From SA5 point of view, what is important is an explicit and visible "trigger" for each and every SA5 measurements to OAM for verification purpose. Considering various gNB architecture (aggregated, disaggregated, CP-UP separated, and any combination thereof), such trigger should be by gNB-CU-UP by supplying the sum of non-averaged D2.1 to D2.4 values to UPF over NG-U, whenever it uses this sum and put it into one of bins for the requested measurement of UL packet delay distribution between NG-RAN and UE. From this sense, NG-U should be enhanced so that gNB-CU-UP can report such sum value (sum of non-averaged D2.1 to D2.4 values) to UPF.

And there are also minor corrections proposed in R3-212287 related to QoS monitoring feature (Proposals and 6), which we think it would be good if corrected this time:

Proposal 5: Include the missing "stop" indicator into QoS Monitoring Request IE in E1AP.

Proposal 6: Include new "UL without D1" and "Both without D1" indicators into QoS Monitoring Request IE in NGAP.

3 – HuaWei Technologies Co.

We dont see the need to report the distribution to UPF either.

OK to P5. For P6, we dont think it is SA5 scope. we never define NGAP signalings based on SA5 requirements. There are much PM measurements defined in SA5 spec, none of them needs NGAP control signalling....

4 – Nokia France

Agree that the need for additional reporting to UPF is not clear.

5 – ZTE Corporation

In the previous LS sent by SA5 (S5-196840/R3-196431), SA5 first requested RAN3 to support UL/DL packet delay measurement as “*To RAN3 group. ACTION: SA5 respectfully asks if RAN3 would like to support the mechanism defined by SA2 for QoS Monitoring per QoS Flow per UE to assist URLLC service (see 5.33.3.2 of 23.501 [3]) in Rel-16.*”

As 5.33.3.2 of 23.501 mentioned, the relevant measurements are reported over NG-U.

5 Conclusion